



Conference Study of Research Needs

Moderators

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Nondestructive Evaluation/Structural Health Monitoring

- Shearography vs. magnetic strain gauge (MSG) and other techniques
- MSG through thickness characterization
- Integration of experimental techniques and analytical modeling
- Accept/reject criteria that ties back to quantitative nondestructive evaluation (NDE) and a validated structural model
- Validated NDE and structural analysis for each type of vessel
- Need to determine the impact of defects on performance
- Low cost and minimal schedule impact composite NDE for broad use in industry
- Reliable NDE/Structural Health Monitoring (SHM) measurements
- Definitive criteria for shearography
- Need NDE standards and testing that result in probability of detection (POD) thresholds
- NDE accept/reject criteria appropriate for the use and/or application
- NDE that is cost effective relative to the cost of the pressure vessel
- Opportunities identified for data sharing inter-government, inter-industry, and international
- NDE with data for recertification and determination of product reliability
- Address manufacturing repeatability appropriate for the intended application
- Codes and standards that grow with the rapid change in composite technology

Structural Modeling

- Efficient modeling techniques
 - Possibly analytical solutions that could be used in real time
 - Validate with experimental measurements
- No modeling technique is available to go from fiber to lamina to component properties for modeling mechanical damage and predicting the failure point
- Better commonality in materials databases
- Consistent methodology for using material properties in structural models
- Vetted statistical models and stochastic models for reliability prediction
- Account for the as-built composite pressure vessel configuration in structural models

Fatigue/Fracture

- Establish the effect of radiation on composites
- Evaluate two-stage fatigue (low vs. high cycle fatigue)
- Determine how design drives the failure modes of composites
- Establish standards and best practices for fatigue and fracture
- Publish critical flaw sizes for current liner materials and configurations
- Publish elastic-plastic liner fracture design and/or test approach
- Model autofrettage from a fatigue perspective
- Assess effect of impact damage on stress rupture life
- Evaluate fatigue durability of liners and damaged composite

Testing/Qualification

- Pneumatic testing
 - Failure mode, overpressure, and fragmentation
- Effects of fast fill on composite pressure vessels
- Effect of cryogenic environments and fluids on composites
- Fluid media compatibility on liner materials
- Gap in measurement science for accurate mass flow during filling
- Hypervelocity testing for damage tolerance
- Certification process established for new designs
- Coordination with ASTM E08 on fracture and fatigue
- Panel on what fatigue and fracture testing is required in different standards

Codes and Standards

- Clear differentiation between AIAA, ASTM, ASME, SAE, DOT, and ISO coverage



Future Action

- NASA White Sands Test Facility coordinating interagency and international research effort
- Composite Conference 2014
 - Point of Contact
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